

# **STS-106 (BI102) FLIGHT READINESS REVIEW**

**Program**

**August 29, 2000**

**SOLID ROCKET BOOSTER**

# AGENDA

Presenter:

Roger Elliott

Organization/Date:

USA-SRB/8-29-00

- Certification Status - No Issues
- Configuration Summary - No Issues
- Special Topic
  - Range Safety Transition Assembly Weld Penetration
  - Forward Booster Separation Motor/Confined Detonating Fuse Initiator Electrical Bonding Not Performed
- Readiness Assessment

## First Time Waivers

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SRB Rate Gyro Assembly (RGA) annual functional test requirement not performed on S/N 103 RGA

- Lubricant stratification has potential to affect bearing performance
- SRB refurbishment specification requires annual functional test for uninstalled units (S/N 103 inactive for 14 months)
- Acceptable bearing performance verified prior to flight
- Waiver WC00255 approved by VEB 8-23-00

Drogue and Main parachute reefing line cutters (RLC) shelf life

- Drogue RLCs expired shelf life 7/00; mains expire 10/00 and 11/00 respectively
- No units available to perform shelf life extension testing per NSTS 8060 requirements; 5 units required
- Acceptable per performance data for three lots of RLCs using same delay mix (drogue); DAS data/ parachute video (mains)

STS-106 B1102-101

# SPECIAL TOPIC - RSS TRANSITION ASSEMBLY

Presenter:

Roger Elliott

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## Observation

- Range Safety System (RSS) transition assembly fillet welds are not full penetration welds

## Concern

- Cracked weld during ascent could expose RSS crossover cables to hot gas

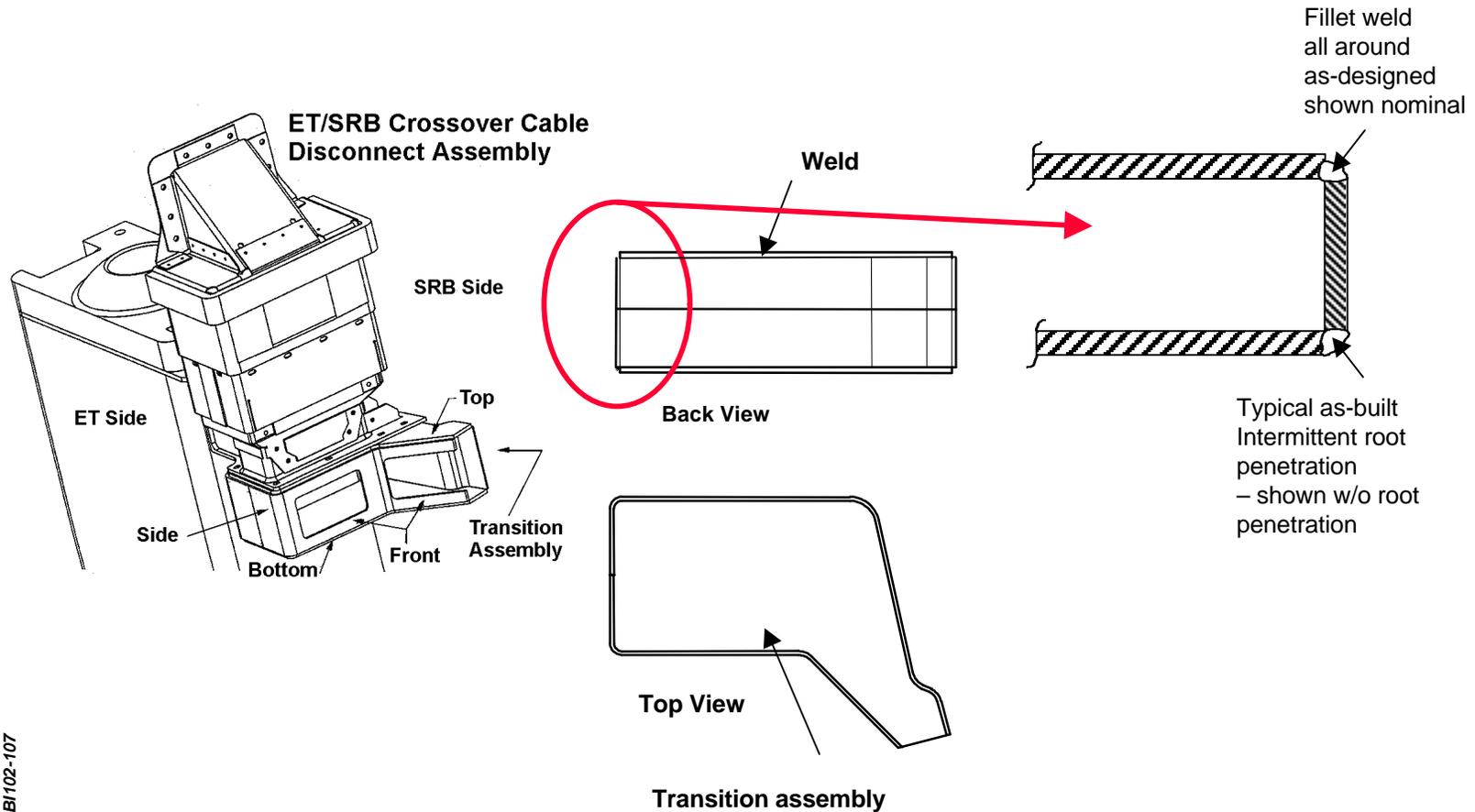
## Background

- Issue identified during refurbishment of bent cover caused at water impact
- Visual inspection of other transition assemblies indicates lack of penetration is fleet wide

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# SPECIAL TOPIC - RSS TRANSITION ASSEMBLY

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## Discussion

- 196 transition assemblies flown with no ascent related problems noted
- Six transition assemblies x-rayed to determine worst case welds
- Two transition assemblies enveloping 16 worst case NDE locations sectioned
- 27 weld samples taken to determine average weld throat length of 0.092 inch (0.085 inch is nominal print requirement)
- Analysis of nominal weld for transition assembly has an ascent minimum ultimate Factor of Safety (FOS) +5.79
- Analysis performed to account for weld root imperfections (ascent minimum ultimate FOS +2.18)
- Fracture analysis identified no discernable crack growth for 0.037 inch deep full length surface crack (over 40 mission life)
- Proofload of worse identified assembly successfully completed

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## Discussion (cont.)

- Original manufacturing radiographic images of transition assemblies installed on STS-106 reviewed by USA NDE
  - STS-106 transition assemblies are in-family with those inspected, analyzed and tested

## Rationale for Flight

- Flown 196 times with no ascent related problems
- Welds on transition assemblies installed on STS-106 are in-family with those inspected, analyzed and tested
- Assembly is protected from hot gas intrusion by thermal protection (BTA/K5NA)
- Analysis demonstrates large FOS ( $> 5.79$ )
- Proofload test confirms large FOS ( $> 2.0$ )
- No increased risk to crew safety or mission success

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# SPECIAL TOPIC - CDF INITIATORS BOND CHECK

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## Observation

Forward Assembly CDF initiators installed without bond checks performed at installation

- Bond checks required per ACO OMRSD
- CDF initiators installed in BSMs and thruster pressure cartridges (nose cap release system)

## Discussion

- CDF initiators not an EMI/ESD concern as defined by NSTS 08060
  - CDF initiator is not an electro-explosive device
  - CDF initiator contains no primary explosive
- Similar CDF initiator design tested for electrical sensitivity in 1965
  - Six units tested; none fired
  - $1 \times 10^6$  ergs electrical discharge; twice per unit

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# SPECIAL TOPIC - CDF INITIATORS BOND CHECK

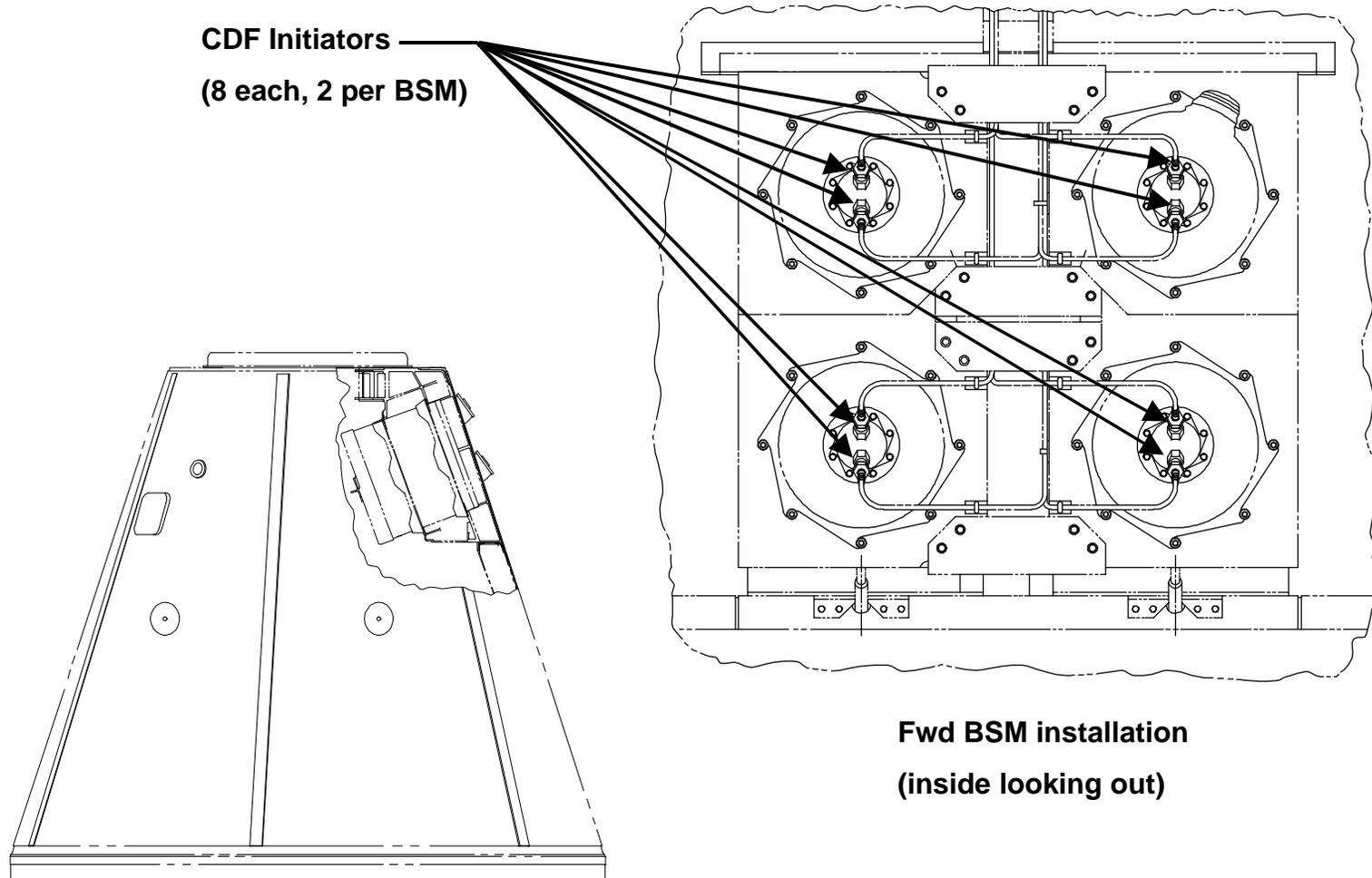
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CDF Initiators  
(8 each, 2 per BSM)



Fwd BSM installation  
(inside looking out)

SRB Frustum

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SRB-8

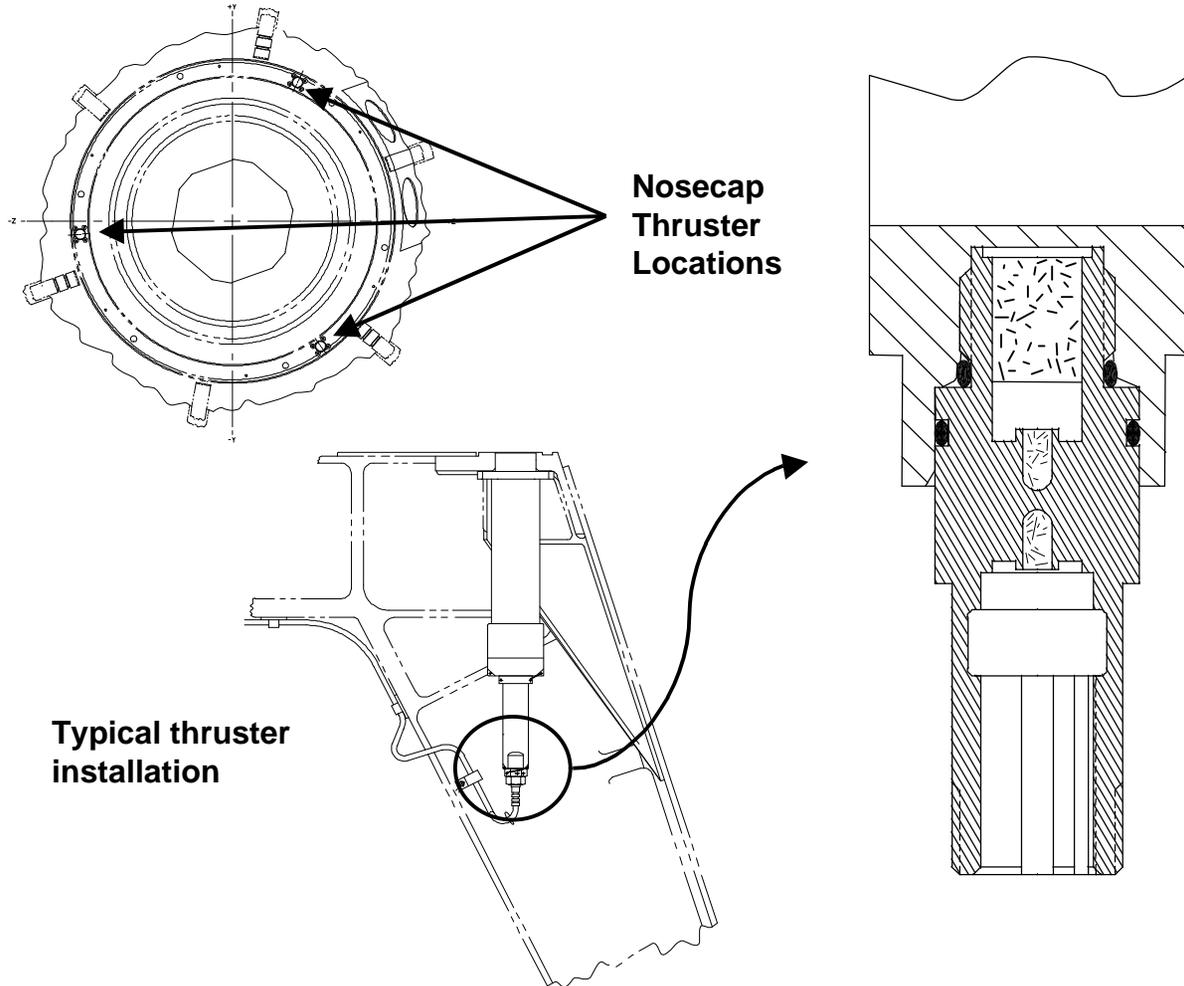
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SRB-9

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## Discussion (cont.)

- MIL-B-5087 requires that a design capability be demonstrated on two representative vehicle installations for electrical bonding
  - CDF initiator bond to BSMs demonstrated 768 times
  - CDF initiator bond to thruster pressure cartridge demonstrated on 4 frustums (12 installations)
- Design is in compliance with 10CEI-0001 and MIL-B-5087 requirements
- Reliability estimate for success rate 0.9996 OMRSD verifications of bond resistance are Go/No-Go; engineering tests show bond capability in 1-2 milliohm range for both BSM and thruster pressure cartridge installations

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## Discussion (cont.)

- CDF initiator metal flange in contact with counterbore in BSM igniter adapter and thruster pressure cartridge
  - Joint torqued to 350 inch-pounds
  - Threads and flange provide large metal faying area

## Rationale for Flight

- Not susceptible to EMI/ESD as defined by NSTS-08060
  - CDF initiator is not an electro-explosive device
  - CDF initiator contains no primary explosive
- Installation results in large metal to metal faying area
  - Components not painted
  - <2 milliohm capability verified by testing similar installations
- Lightning and EMI path is BSM to structure, which is verified
- Aft BSM initiators (same design) passed all bond checks to date; 768 installed

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# READINESS ASSESSMENT

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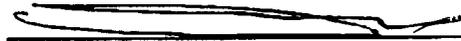
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- Pending completion of open work, resolution of Range Safety Transition Assembly weld penetration and CDF Initiator electrical bonding issues, there are no constraints for flight for STS-106

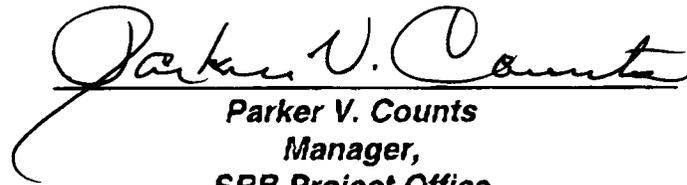
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# ***STS-106 (BI102) Flight Readiness Review***

***Pending satisfactory completion of open items and normal operations flow,  
we certify the Booster Assembly hardware ready to support  
the launch of STS-106***



***Gordon P. Nielsen  
Associate Program Manager/USA  
SRB Element***



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Manager,  
SRB Project Office***